REMARKS

I. Summary of the Office Action

Claims 1-19 are pending in the application. The Examiner has rejected claim 1, under Section 103(a) as being unpatentable over U.S. Patent No. 5,864,545 (Gonikberg). Further, the Examiner has objected to claims 8 and 18 for various informalities.

II. Summary of this Reply

In this Reply, claims 8 and 18 are amended to address the objections listed in Paragraph 1 of the Office Action.

The Examiner has rejected claim 1 under 35 U.S.C. §103(a), asserting obviousness over Gonikberg. Applicant respectfully traverses.

III. U.S. Patent No. 5,864,545 (Gonikberg)

Gonikberg discloses a system and method for improving convergence during modem training and for reducing computational load during steady-state modem operations. In particular, Gonikberg employs a phase-splitting T/3 equalizer and echo canceller structure. The echo canceller and equalizer are each trained with a fixed phase splitting filter thereby allegedly improving convergence performance. After training, the equalizer is convolved with a fixed phase splitting filter to provide a combined phase splitting equalizer and the equalizer is also convolved with the echo canceller to provide a combined echo canceller.

IV. Response to 103 Rejections

The Examiner has rejected claim 1 under 35 U.S.C. §103(a), asserting obviousness over Gonikberg.

A section 103 rejection is proper only if all claim limitations are taught or suggested by the prior art. MPEP § 2143.03.

Claim 1 recites a modem for establishing communication between a first device and a second device via a communication medium, the modem for passing a transmit signal generated by the first device via a transmitter to the communication medium and passing a receive signal from the communication medium to a receiver for processing by the first device. The modem is coupled to the communication medium through a hybrid circuit. The modem comprises a Farrow phase shifter positioned between the first device and the hybrid circuit to shift the phase of the transmit signal and an equalizer positioned between the hybrid circuit and the first device to minimize intersymbol interference in the receive signal, this equalizer having an adaptive input. The modem further comprises a primary echo sub-canceler having an input coupled between the Farrow phase shifter and the hybrid circuit to receive the phase shifted transmit signal and an output coupled between the hybrid circuit and the equalizer. This primary echo sub-canceler is adapted to remove a first portion of an echo in the receive signal. The modem further comprises a post equalizer echo canceler having an input coupled between the Farrow phase shifter and the hybrid circuit to receive the phase shifted transmit signal and an output coupled between said equalizer and the first device. This post equalizer echo canceler has an adaptive input and is adapted to remove a second portion of the echo in the receive signal. The modem further comprises a slicer positioned between the output of the post equalizer echo canceler and the first device, the slicer having an output for producing a standard symbol value which is a

representation of a current symbol value being supplied at an input of said slicer by the receive signal, the difference between the input and the output of said slicer being supplied to the adaptive input of said equalizer and to the adaptive input of said post equalizer echo canceler.

An important feature of the invention defined by claim 1 is the use of the Farrow phase shifter. As described in paragraph 11 of the specification:

> The transmit signal out of the transmitter 106 is phase shifted by a Farrow phase shifter 108. The phase of the transmit signal is shifted such that a signal, which is based on the transmit signal, received at the TCCO 100 has an appropriate phase. The necessary phase shift introduced by the Farrow phase shifter 108 is calculated at the TCCO 100 and transmitted from the TCCO 100 to the modem using known training protocol

Applicants submit that this use of a Farrow phase shifter is clearly distinguishable from Gonikberg's pre-emphasis and shaping filter 641 that was cited in paragraph 2 of the Office Action. As an initial matter Applicants submit that Gonikberg fails to teach or suggest that his pre-emphasis and shaping filter 641 performs a phase shifting function (neither in Gonikberg itself nor in the U.S. patent application Ser. No. 08/748,854 incorporated by reference in the col. 8, lines 14-24 passage cited by the Examiner as containing this feature).

Further, claim 1 recites "a post equalizer echo canceler [128] coupled between the Farrow phase shifter and the hybrid circuit to receive the phase shifted transmit signal" (lines 14-15). Gonikberg's counterpart to item 128 is a main echo canceller 310a. Gonikberg uses an echo interpolator 681 to update this main echo canceller. As recited in claim 1 (and as depicted in Fig. 1), the present invention does not require such an echo interpolator as this function is integrated into the Farrow Phase Shifter. The invention thereby attains costs savings over the Gonikberg design.

Even assuming arguendo that Gonikberg's shaping filter 641 is comparable to claim 1's Farrow phase shifter 108, claim 1 is still distinguishable over Gonikberg in the manner in which this shifter is positioned relative to the echo canceler. The Examiner has noted this difference in the last two sentences of paragraph 2 of the Office Action, stating that "applicant has not disclosed that echo canceller location solves any stated problem or is for any particular purpose... [I]t appears that the invention would perform equally well with the echo canceller in either location".

As stated in the Abstract, the present invention is used "to achieve a computationally efficient modem" (lines 1-2). As illustrated in Fig. 1, the relative positioning of the Primary Echo Sub-Canceller 126 results in not requiring it to be updated, thereby resulting in greater efficiency and reduced cost. In comparison, the corresponding element of Gonikberg (item 684 of his Fig. 7) needs to be continuously updated.

Accordingly, Applicants submit that the positioning of the Farrow filter, as well as the nature of the Farrow filter itself results in claim 1 neither being taught nor suggested by Gonikberg. For at least these reasons, claim 1 is patentable.

Therefore, reconsideration and withdrawal of the rejection of claim 1 is requested respectfully.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant believes claim1 to be patentable and the application to be in condition for allowance, and requests respectfully issuance

of a Notice of Allowance. If any issues remain, the undersigned requests a telephone interview prior to the issuance of an action.

Respectfully submitted,
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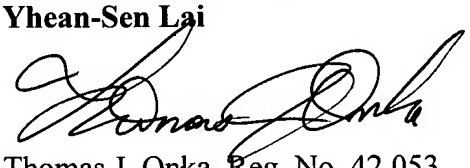
By: 

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